Roadside
Vegetation Management

May 2017

Missouri Department of Transportation

Index

Figures

Roadside Vegetation Management

The Missouri Department of Transportation's (MoDOT) roadside management philosophy is to preserve, enhance and diversify the roadsides of Missouri's transportation system. Our roadside management program helps keep Missouri roadsides safe and attractive. This program establishes and maintains desirable roadside vegetation to control erosion. Another aspect of this philosophy is to promote, preserve and establish pollinator-beneficial habitats when feasible.

This is accomplished through several methods, including an effective herbicide program, fertilization, mowing, brush control and litter removal. Wildflower and native grass plantings, landscaping and naturalized vegetation are also part of maintaining and improving safety and roadside appearance. Combining different management practices, such as these, form an Integrated Roadside Vegetation Management (IRVM) program.

The sharing of best practices among districts results in greater efficiency and effectiveness. Money is saved on labor and mobilization by making mowing a focused priority during scheduled times. Consistency is also improved.

Roadside Vegetation Management Policy

Vegetation in sight distance areas shall be controlled as necessary on all routes.

Equipment shall not be used on slopes steeper than 3 to 1 unless designed for that purpose. Reliable, manufactured slope indicators shall be used on all mowing equipment.

New trees or hardscape features shall not be permitted within 30 feet from the nearest traveled way. This distance is extended to 40 feet on routes with 65-70 mph speed limits. Exceptions may be permitted if behind barriers or if other special circumstances exist.

Vegetation shall be removed that interferes with the visibility of MoDOT signs.

Traffic control shall be performed according to the most recent edition of MoDOT's Traffic Control for Field Operations manual.
http://epg.modot.mo.gov/index.php?title=616.23_Traffic_Control_for_Field_Operations

Noxious weed control shall be done on all routes, as required by federal, state and county laws and regulations. Noxious weed control shall be by either chemical or biological means.

Vegetation management practices shall not conflict with efforts to protect state and federally designated endangered species. Refer to Heritage Database Information. Contact the Design Division's Environmental Section at 573-526-4778 for assistance.

Major Roads
Vegetation Management Guidelines

Consistency is expected on major corridors. Coordination of mowing is needed to ensure no abrupt changes in roadside management practices are apparent at district or area boundaries.

Minimum mowing height is six inches.

Slopes steeper than 3 to 1 and areas not required to be mowed should be planted to wildflowers and native grasses, encouraged to naturalize or landscaped. Pollinator-beneficial vegetation should be promoted in these areas.

Do not leave a narrow strip (less than one additional pass) between the main roadway and outer roads. Areas between the main roadway and the outer roads 30 feet wide or less should be mowed the entire width with each cycle.

An urban area is where the surrounding land is dominated by housing developments and commercial properties. There are no large gaps of areas without housing or commercial development. Each urban area should be evaluated to determine the extent of mowing needed. Urban areas may be mowed more often and wider but the intent is to reduce the total acres mowed and number of mowing cycles.

Community mowing may be done for special events, festivals and fairs. This mowing should be one pass. All mowing must be part of the planning process to avoid unnecessary mowing.

PGRs mixed with a broadleaf herbicide may be used to reduce mowing cycles and trimming around guardrails, guard cables, sign posts and sight distance areas. Selectively applying herbicides to control brush up to 50 feet from the roadway is permitted.

The number of mowing cycles may be adjusted and coordinated statewide if growing conditions require it.

Main Roadway

All major roads should be mowed 15 feet from the edge of the paved or aggregate shoulders or where the grass begins unless physically obstructed around mid-May and mid-July. A final mowing of up to 30 feet should be completed every year beginning in mid-September.

Selectively applying herbicides to control brush up to 50 feet is permitted.

Medians (Figures 1 and 2)

Medians less than 60 feet wide shall be mowed entirely each mowing cycle. Medians wider than 60 feet may be mowed 15 feet in each direction and, if less than 100 feet wide, should be mowed entirely for the final mowing. Medians over 100 feet in width should be mowed up to 30 feet in

each direction from the edge of the paved or aggregate shoulders or where the grass begins for the final mowing.

Interchanges (Figure 4)

Mowing interchanges requires a large resource commitment. Each interchange should be evaluated as to the extent of mowing needed. Interchanges on major roads should be mowed 15 feet from the edge of the paved or aggregate shoulders or where the grass begins unless physically obstructed in mid-May, mid-July and beginning in mid-September. Mowing may be done on the interior of interchanges, if necessary, where slopes are 3 to 1 or flatter. Consider mowing the interior of interchanges before April 1 or after the first frost to limit mortality to monarchs and pollinators.

Mowing Width per Cycle on Major Routes	
1st cycle	Mow 15’
2nd cycle	Mow 15’
3rd cycle	Mow up to 30’

Minor Roads (Figure 3)
Vegetation Management Guidelines

The height of minor road vegetation should be maintained between six and 18 inches. Mowing should begin when 50 percent of the vegetation reaches 18 inches in height.

Vegetation may be maintained by using PGRs mixed with a broadleaf herbicide or by mowing. The area for vegetation control is six to 15 feet unless physically obstructed. This is intended to be one pass with the type of equipment used.

A final mowing may be done if the slopes are 3 to 1 or flatter. It should not begin until the chance of significant regrowth is minimal. The final mowing area may extend up to 30 feet from the edge of the pavement each odd numbered year. The final mowing area may extend up to 15 feet each even numbered year.

Areas within 30 feet of the roadway with heavy brush should be treated with selective herbicides to control brush.

Slopes steeper than 3 to 1 and areas not requiring mowing should be planted to native grasses and wildflowers, encouraged to naturalize or landscaped. Give consideration to promoting or planting pollinator-beneficial vegetation.

The number of mowing cycles may be adjusted and coordinated statewide if growing conditions require it.

Final Mowing Width on Minor Routes	
Odd numbered year (2017, 2019, etc.)	Mow up to 30’
Even numbered year (2018, 2020, etc.)	Mow up to 15’

High-Profile Areas
Vegetation Management Guidelines

These areas include raised medians, islands, roadside parks, commuter parking lots and high-profile areas with considerable pedestrian traffic. These locations require the highest level of vegetation management and cleanliness. Vegetation should be maintained in a turf-type manner with vegetation height maintained between four and eight inches.

Typically, this turf should be mowed with walk-behind mowers, lawn-type mowers and line trimmers.

Recommended Practices

The sharing of best practices among districts results in greater efficiency and effectiveness.

Personnel engaged in mowing should be trained in the operation of mowers and must be familiar with the applicable safety guidelines. Safety information is here http://sharepoint/systemdelivery/MT/SitePages/Roadsides.aspx

Fleet

1. Fleet composition should be examined and comprised of tractors and mowing attachments that are optimal for the terrain and obstacles that are present in specific areas.
2. Accurately enter and maintain mower attachments inventory in FASTER. Stagger equipment inspections according to season. This allows for equipment to be properly inspected and all repairs made prior to the beginning of season.

Materials

1. The Herbicide Manual should be used as a guideline for herbicide programs. The Herbicide Manual is at: http://epg.modot.org/index.php?title=Category:821_Herbicides_and_Roadsides.
2. A pre-season meeting to discuss herbicide treatments should be held.

Communication

1. Discuss mowing plans during statewide conference calls to increase consistency between districts. This is also recommended on a district level to improve consistency between areas.
2. Develop a district specific vegetation management plan, including herbicides and mowing. The plan should also be communicated and readily accessible to district and division maintenance personnel.
3. When a major route corridor spans district lines, the districts should work together to ensure no abrupt changes in roadside management practices are apparent at district or area boundaries. Provide speaking points for customer service representatives and other district personnel to consistently answer questions from the public regarding mowing practices.
4. Collaborate with district communications personnel to create public information pieces to inform our customers on work that will be completed. Examples of successful public relations pieces are news releases, fliers, social media posts, and information posted on the website.
5. Communicate herbicide and PGR plans (recently completed and upcoming) to mowing personnel.

Labor

1. Analyze the area with the purpose of mapping out a circular route to increase efficiency by eliminating or significantly reducing deadheading.
2. Actively monitor working hours and overtime of personnel by flexing work schedules during the work week once an employee reaches 40 hours.
3. Encourage short mowing cycles with all mowers operating, and make mowing a focused priority during scheduled mowing times. This will help save money on labor and mobilization, and improve consistency.

Operations

1. Encourage the expansion of the Adopt-A-Highway program for mowing.
2. Develop and encourage areas of native vegetation including pollinator-beneficial vegetation.
3. The Roadside Vegetation Management policy, guidelines and recommended practices will be reviewed as needed.

Trimming

1. Trimming should be evaluated for need at each mowing cycle.
2. The use of total vegetation control (bareground) should be limited to a 30” radius around signs to limit erosion problems.

Safety

1. Tractor tires should be set at the appropriate width and inflation that provides optimum stability. Always consult the operator's manual before making any adjustments to the tractor tires.
2. For safety concerns and appearance purposes, a cut should not be made on top of rock cuts or down from the top of an unmowed slope. May be mowed for sight distance if needed.
3. Dead trees and limbs, fallen or standing, which may create a hazard, should be promptly removed. Trees on the roadway should be removed as soon as possible, suspending other lower priority work if necessary.

Appearance

1. Coordination of the mowing effort is important not only between areas but between districts to ensure that no abrupt changes in roadside management practices are apparent at district or area boundaries.
2. The transition between mowing widths and patterns will vary and should be gradual to give a natural and pleasing appearance.
3. All required trimming should be completed with each mowing cycle. PGRs plus a broadleaf herbicide applied in the spring prior to seedhead development will help control vegetation height and reduce the need for trimming. Total vegetation control may be used around

objects with care.

4. Litter visible to roadway travelers should be removed prior to and after each mowing cycle. Coordinate with incarcerated personnel activities where available.
5. Landowners are allowed to mow the right-of-way adjacent to their property.

Herbicides

1. Only herbicides in the Herbicide Manual are approved for use. Other herbicides must be approved by Central Office Roadsides.
2. Undesirable weeds should be controlled by either chemical or biological means.
3. An effective herbicide program is a strong part of a properly managed roadside.
4. Herbicides may be used to keep sidewalks, paved slopes, paved islands, paved shoulders, commuter parking lots, drains, pavement joints, barriers, curb lines, paved ditches, etc. free of vegetation. If growth does occur in these areas, the vegetation should be removed. Invasive plant species should be controlled that are considered mutually undesirable by MoDOT and adjacent landowners.

Cultural Practices

1. Erosion control measures may be necessary if there is not adequate vegetation to prevent erosion or if operations require removal of vegetation and there is a possibility that silt will leave the right-of-way.
2. Fertilization and/or reseeding should be considered where difficulty in establishing vegetation is encountered.
3. Mowing height is the actual height of cut to prevent scalping and other damage.
4. Do not mow when turf and soil conditions are wet to the point that turf damage or ruts will occur.
5. Native vegetation should be left standing and encouraged in areas that are prone to drifting snow. (Figure 6)
6. Delayed mowing allows for seed production which may result in healthier stands of turf.
7. Mowers should be regularly cleaned to eliminate the spread of weeds, especially if mowing noxious or problem weeds.

Miscellaneous

1. Refer to your district roadside representative for assistance.
2. When mowing to the ditch line, it is acceptable to make a five to eight foot cut on the back side of a V-ditch to help maintain drainage if it can be accomplished without placing the tractor on a slope steeper than 3 to 1 or causing damage. A cut on the backside of the ditch should not be made for appearance purposes. The preferred alternative is the selective use of herbicides. (Figure 7)
3. Areas of wildflower, native grass and tree plantings may be signed to indicate what is being accomplished at these locations.

4. Areas around and under bridges should be kept clear of brush and may be mowed if done without placing the tractor on a slope steeper than 3 to 1. The selective use of herbicides is the preferred control method.
5. Culverts should be kept clear of brush.
6. Control the vegetation around the continuous traffic monitoring sites to allow access. Use incarcerated crews if possible. Total vegetation control should be used for season-long control. The treated area should not be very large to reduce erosion. This is a link to the box locations map: http://sharepoint/systemdelivery/TP/sysanlysis/dmas/Shared%20Documents/Maps/Other%20Maps/ATRStatewide2014.pdf

Definitions

Biological Control: Usually involves the use of insects and disease-causing agents that attack certain weed species. An example is the control of musk thistle with the thistle head weevil. For effective biological control, the insect or disease must affect only the weed requiring control and the insects must have few natural enemies that interfere with their activity.

Brush: Coarse, woody vegetation growing in an undesirable location.

Chemical Control: The use of herbicides to control vegetation. Refer to Herbicide Manual.

Consistency: Statewide seamless and continuous roadside management practices over time to ensure no abrupt changes are apparent at district or area boundaries.

Ditch Line: Ditch lines are considered to be to the back of a flat bottom ditch and to the bottom of a "V" ditch for roadside vegetation management purposes.

Divided Highway: Highway with physical separation of traffic in the opposite direction.

Endangered Species: Plants or animals considered by the state or federal government to be in danger of extinction or require protection to maintain their existence.

Hardscape Features: Landscape materials such as timbers, segmental block retaining walls and boulders that could create an obstacle if unprotected.

Herbicide Program: Utilize appropriate equipment, herbicides and trained personnel for the application of products as specified in the Herbicide Manual. The objective is to control noxious and undesirable plant species, as well as manage plant growth by applications of plant growth regulators and side trimming.

Heritage Database Information: Location maps and specific species information about endangered species located within the state of Missouri. Refer to maps available in the districts. See the Maintenance Policy Manual, Section RDS(A4).

High-Profile Areas: Areas with high traffic counts which may be subjected to idle viewing by the motorist and/or have considerable pedestrian traffic.

Integrated Roadside Vegetation Management (IRVM): A decision-making and quality management process for maintaining roadside vegetation that integrates the following:

- needs of the local communities and highway users;
- knowledge of plant ecology, design, construction and maintenance considerations;

- monitoring and evaluation procedures;
- government statutes and regulations and
- technology.

IRVM uses cultural, biological, mechanical and chemical pest control methods to economically manage roadsides for safety plus environmental and visual quality.

Invasive Plant Species: An aggressive plant species which tends to spread. This includes noxious weeds.

Islands: Areas surrounded by driving lanes, turn lanes or ramps, etc. They may be vegetated or paved. They may be at-grade or raised.

Major Roads: The major highway system is all routes functionally classified as principal arterials. The principal arterial system provides for statewide or interstate movement of traffic. In urban areas, principal arterials carry traffic entering or leaving the urban area and serve for movement of vehicles between central business districts and suburban residential areas. The major roads in Missouri total approximately 5,500 centerline miles.

May: Permitted.

Median Width: Distance measured between the edge of traveled ways on a divided highway. The median width measurement includes the width of the inside shoulders.

Minor Roads: The minor highway system is all routes functionally classified as minor arterials or collectors. These routes mainly serve local transportation needs and include highways commonly referred to as lettered routes, such as Route A, Route C and Route DD. The minor roads in Missouri total approximately 28,400 centerline miles.

Mowing Cycle: The amount of time to mow and trim an area or route from start to finish is one cycle.

Native Grasses: Grasses which occur naturally or were known to exist prior to European settlement. (Figure 8)

Naturalized Areas: Areas allowed to flourish with native or non-invasive plant growth. These areas may have a random mix of what has established on its own or have selected vegetation management practices used to promote optimum desirable growth. (Figure 9)

Noxious Weed: A plant which is troublesome and undesirable, and declared so by state law. Noxious weeds in Missouri are: Canada thistle, Scotch thistle, musk thistle, purple loosestrife,

marijuana, Johnsongrass, multiflora rose, kudzu, cutleaf teasel, common teasel, field bindweed and spotted knapweed. MoDOT is thereby required by law to control these plants on right-of-way. The Johnsongrass law is subject to county option. Regardless of county option, the department shall make an effort to control this plant on right-of-way. Methods of control are specific to individual plants and MoDOT's Herbicide Manual shall be followed in developing control practices. Control efforts should be documented.

Noxious Weed Control: Documented efforts to reduce and possibly eradicate an undesirable or noxious weed. Efforts include both chemical and biological methods.

Plant Growth Regulators: A chemical which suppresses the top growth and seedhead production of a plant. Should be mixed with a broadleaf herbicide to improve results.

Pollinators: Generally means any insect, bird or mammal capable of transferring pollen from flowers.

Raised Medians: Areas between driving lanes that may be grass or paved (or a combination) and are elevated.

Right-of-Way Line: MoDOT's property line between MoDOT and adjacent property owner.

Shall: Mandatory.

Should: Strongly recommended. Expected in typical situations with exceptions explainable.

Sight Distance: All vegetation should be maintained at intersections and curves along state rights-of-way to maximize drivers' visibility. Most sight distances can be maintained by a clear view unobstructed by vegetation, along the main roadway approximately six to 10 feet from the edge of the traveled way. At intersections created by cross roads and gore points, the sight distance may need to be extended if necessary.

Slope Indicators: A mechanical device that operates on the same basis as a (bubble) level by indicating the degree of slope.

Total Vegetation Control (TVC): A chemical(s) to eliminate all vegetation to reduce trimming around signs, guardrails and other objects. Application should not extend more than 30 inches from the object to reduce the risk of erosion.

Traveled Way: Portion of the roadway intended for movement of motorized traffic. The white line strip on the edge of the road surface would typically designate this.

Trimming: Vegetation control to eliminate unsightly growth remaining after the mowing is

complete. Includes line trimming, pulling and other manual means. Vegetation control under or around fixed objects within the mowed area. To manage vegetation in such a manner that keeps it consistent with the surrounding vegetation.

Undesirables: Vegetation which chokes out, shades out or competes with the intended vegetation at the given location. This includes any plant in the wrong place. Undesirables include but are not limited to poison hemlock, giant ragweed, phragmites and others. Noxious weeds are included in this category. Several are listed in the Herbicide Manual.

Undivided Highway: Highway with no physical separation of traffic in the opposite direction.

Urban Areas: Fully-developed areas where the surrounding land is dominated by housing developments and commercial properties. There are no large gaps of areas without housing or commercial development.

Visible Litter: Litter in a size or quantity noticeable to roadway travelers.

V-Ditch: Ditch with little or no flat bottom.

Wildflowers: Reoccurring broadleaf flowering plants in a naturalized area. (Figure 8)

Major Roads
Vegetation Management Guidelines
Medians Less Than 60’ Wide

Figure 1

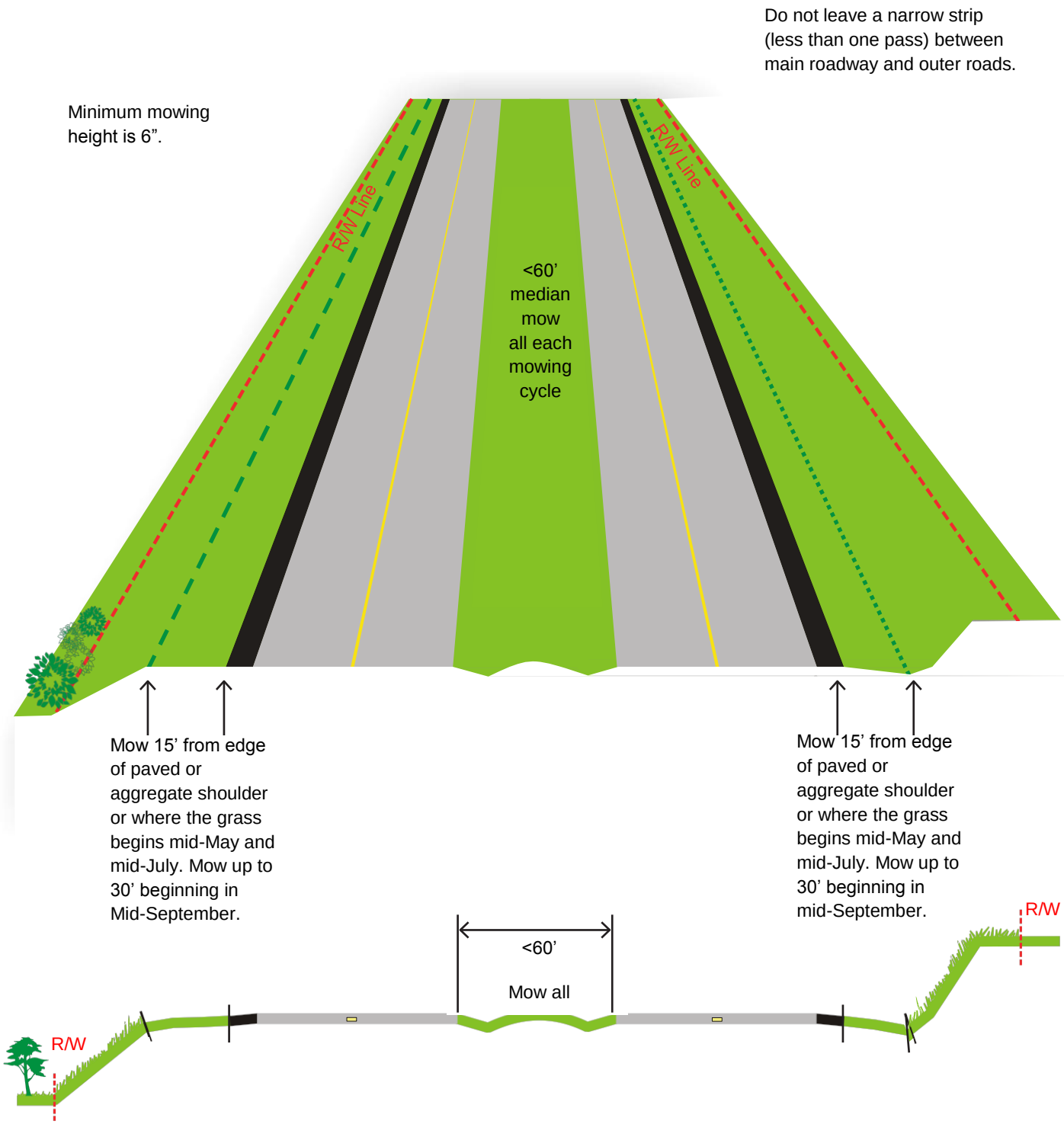
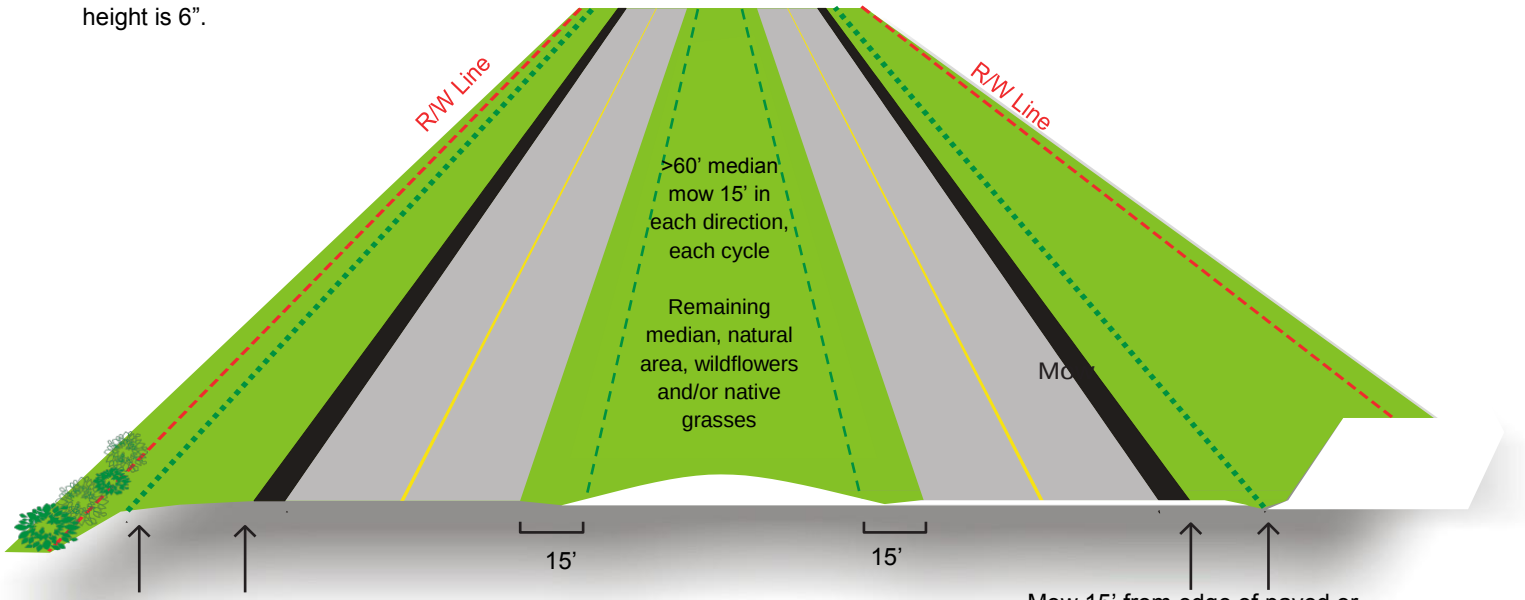


Figure 2

Major Roads
Vegetation Management Guidelines
Medians Over 60’ Wide

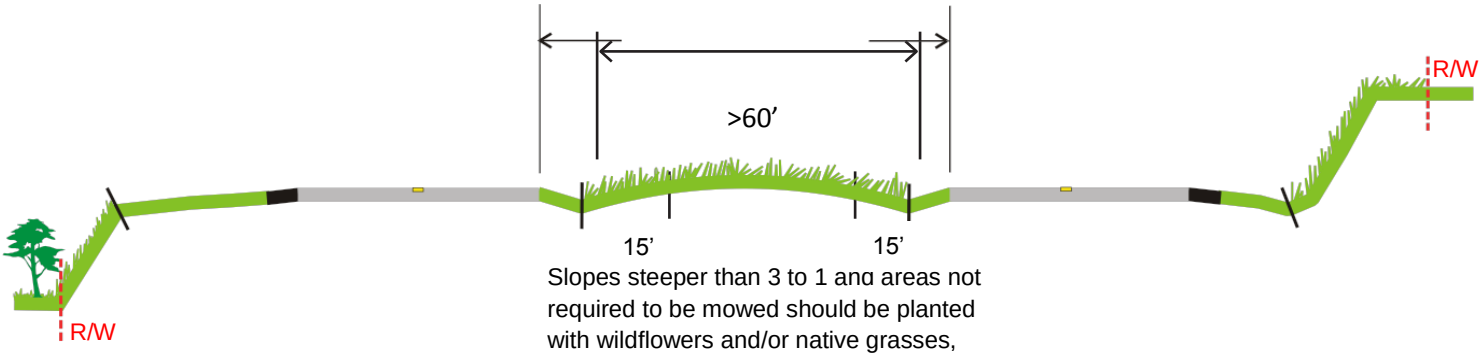
Do not leave a narrow strip (less than one pass) between main roadway and outer roads.

Minimum mowing height is 6”.



Mow 15’ from edge of paved or aggregate shoulder or where the grass begins mid-May and mid-July. Mow up to 30’ beginning in mid-September.

Mow 15’ from edge of paved or aggregate shoulder or where the grass begins mid-May and mid-July. Mow up to 30’ beginning in mid-September.



Slopes steeper than 3 to 1 and areas not required to be mowed should be planted with wildflowers and/or native grasses, naturalized or landscaped.

Final median mowing:
60’-100’ wide – mow all

>100’ wide mow 30’ in each direction

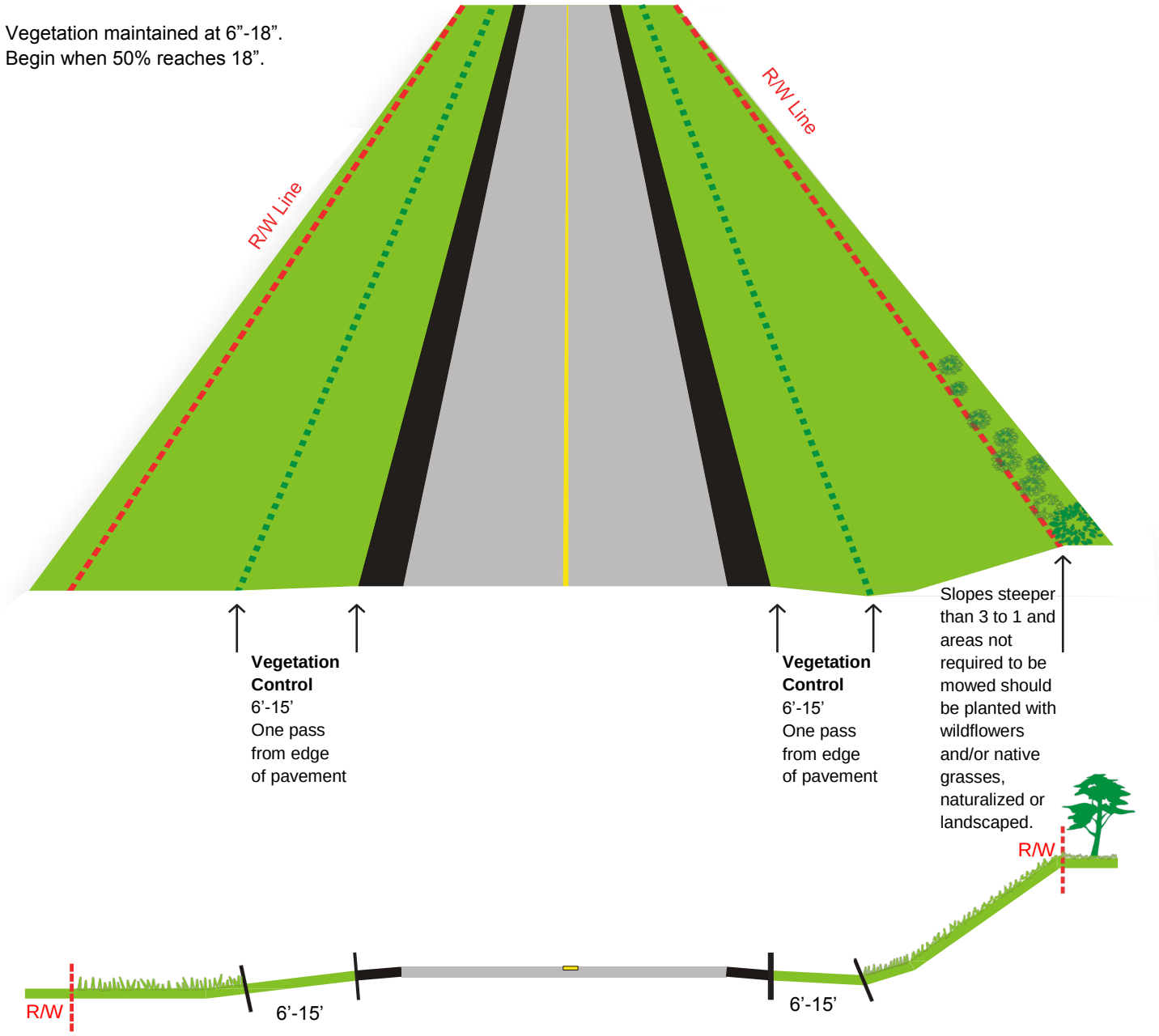
Minor Roads
Vegetation Management Guidelines

Figure 3

Vegetation maintained by PGRs mixed with a broadleaf herbicide or mowing.

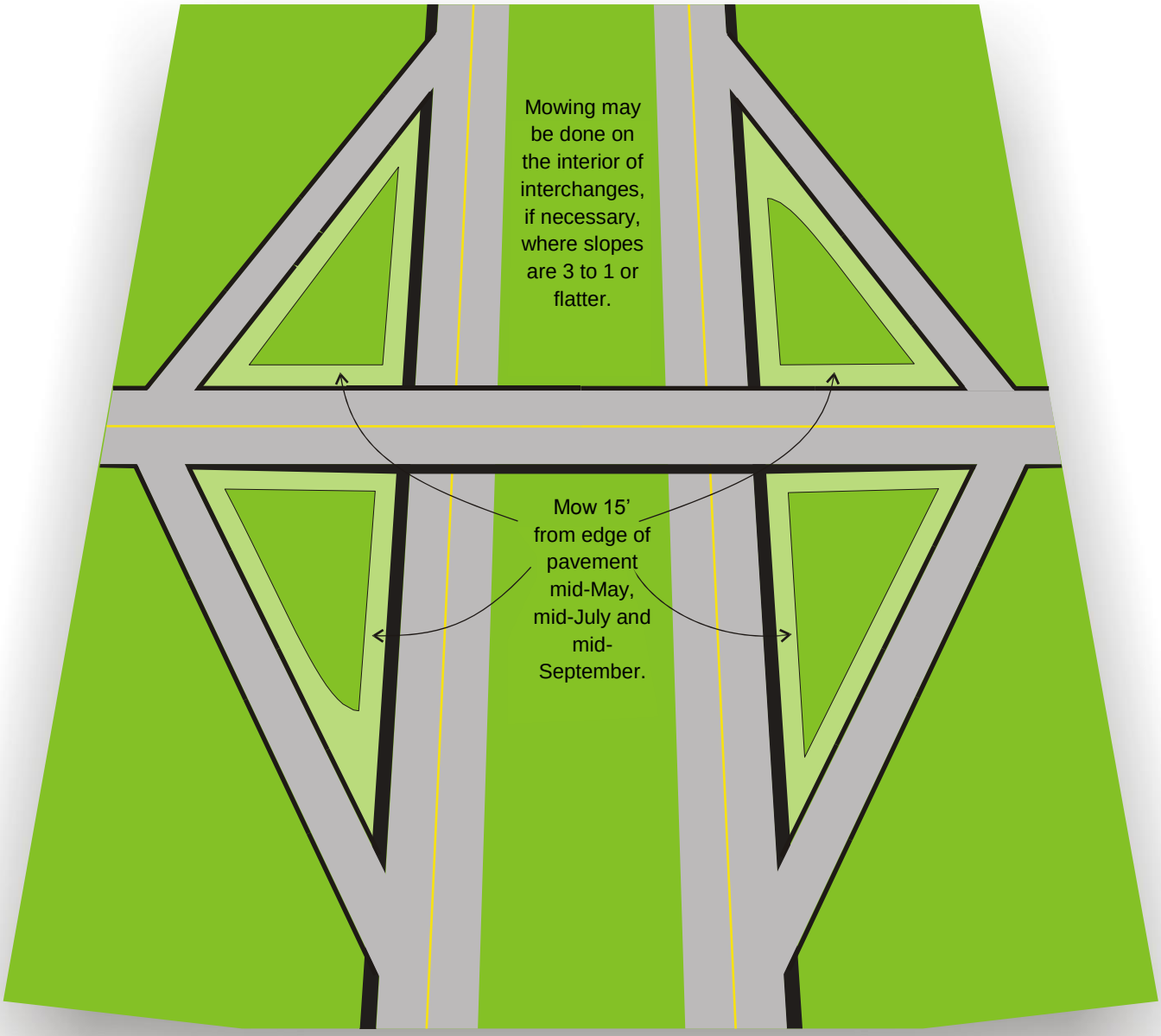
Final mowing may be done if slopes are 3 to 1 or flatter and may extend 30’ from the edge of the pavement on odd years and 15’ on even years.

Vegetation maintained at 6”-18”. Begin when 50% reaches 18”.



Give consideration to promoting or planting pollinator-beneficial vegetation.

Major Road Interchanges Figure 4



Evaluate each interchange to determine extent of mowing needed. Consider mowing the interior of interchanges before April 1 or after the first frost to limit mortality to monarchs and pollinators.

Mowing and Spraying Strip Widths

Figure 5

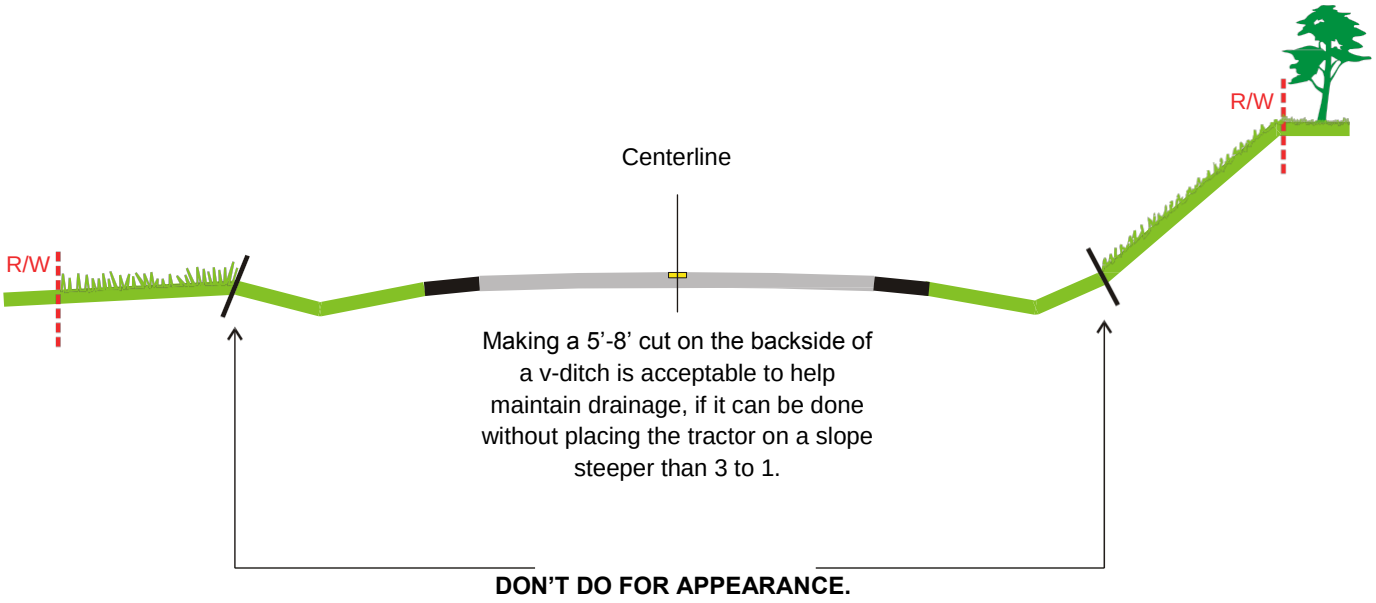
Mowing and Spraying Strip Widths

Strip Width (Feet)	Approximate acreage in one mile	Miles traveled to equal one acre	Strip Width (Feet)	Approximate acreage in one mile	Miles traveled to equal one acre
1.0	0.12	8.25	**8.0**	0.97	1.03
2.0	0.24	4.13	**9.0**	1.09	0.92
3.0	0.36	2.75	**10.0**	1.21	0.83
4.0	0.48	2.06	**11.0**	1.33	0.75
5.0	0.61	1.65	**12.0**	1.45	0.69
6.0	0.73	1.38	**14.0**	1.70	0.59
7.0	0.85	1.18	**16.5**	2.00	0.50

Native Vegetation Preventing Snow Drifts Figure 6

Ditch Cut (Mowing Backside of a V-Ditch)

Figure 7



Wildflowers and Native Grasses

Figure 8

Yellow & purple coneflower, purple beardtongue & ox-eye daisy

Big bluestem

Indian paintbrush & betony

Coreopsis

Rudbeckia

Indiangrass

Big bluestem & rudbeckia

Naturalized Area

Figure 9